

## Measurements of Liquid Densities of 1-Butanol and CO<sub>2</sub> +1-Butanol via a Vibrating Tube Densimeter up to 363 K and 25 MPa

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Special equipment was used to experimentally measure  $PvT$  and VLE data of binary and ternary mixtures with the vibrating tube method up to 25 MPa and temperatures to 523 K. The apparatus used in this work has a sapphire tube cell (a feed cell and pressure control cell). The main objective of this cell is to determine the transition phase, visualizing the appearance and disappearance of the meniscus by a cathetometer with the video camera. Its connected to the measuring cell containing of the vibrating-tube densimeter.

The  $PvT$  data of binary systems studied in this work (Galicia-Luna *et al.*, 1999) is a part of a project currently ongoing at the Thermodynamics Laboratory. The main objective of this project is to perform systematic studies of  $PvT$  and phase behavior of binary mixtures containing CO<sub>2</sub> and alcohol (from ethanol to decanol) in order to select the best supercritical fluid operating conditions which are aimed to industrial applications such as: extraction of colorants, red colors from *beta vulgaris* and yellow colors of the cempasuchil flour of Mexico (*tagetes erecta*).

Liquid densities of 1-Butanol have been measured for five isotherms from 313.15 K to 362.72 K and pressures up to 25 MPa with uncertainty better than  $\pm 0.15$  %. Also, liquid densities of CO<sub>2</sub> + 1-Butanol were determined for two mole fractions ( $y(\text{CO}_2) = 0.0744$  and  $0.2528$ ) at six temperatures, from 313 to 363 K, up to 25 MPa with a cumulative uncertainty better than  $\pm 0.15\%$ . Each set of data was correlated using an eleven parameter BWRS equation of state by least square optimization having a percent relative deviation better than 0.3%.

Experimental  $PvT$  data of methanol and CO<sub>2</sub> via a vibrating tube densimeter up to 363 K and 25 MPa., Luis A. Galicia-Luna\*, Abel Zúñiga-Moreno and Ismael Rojas Hidalgo, presented at the Annual Meeting - Aiche at Dallas TX, November 1-5, 1999.